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Rahnella aquatilis Sepsis in an Immunocompetent Adult

CHULHUN LUDGERUS CHANG, JOSEPH JEONG, JEONG HWAN SHIN, EUN YUP LEE, AND HAN CHUL SON*

Department of Clinical Pathology, College of Medicine, Pusan National University, Pusan, Korea

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***Rahnella aquatilis*, a rare enteric gram-negative rod which is infrequently isolated in immunocompromised patients, was isolated as a causative organism of sepsis in a 26-year-old immunocompetent male patient. The contaminated intravenous fluid was confirmed to be the source of the organism.**

Rahnella aquatilis is a member of the family *Enterobacteriaceae*, and its natural habitat is water. The organism is rarely isolated in clinical specimens. The infections ascribed to this organism are bacteremia (6, 10), sepsis (4), respiratory infection (5), urinary tract infection (1), and wound infection (7) in immunocompromised patients and infective endocarditis (8) in patients with congenital heart disease.

In this paper we report what we believe to be the first case of sepsis due to an infusion of fluid contaminated with *R. aquatilis* in an immunocompetent adult.

Case report. The 26-year-old male patient was in good health with no previous history of chronic debilitating diseases, such as diabetes mellitus, hypertension, hepatitis, or renal failure. Three weeks before his visit to the emergency room, he purchased a bottle of 1,000-ml 5% dextrose water mixed with 15 mg of vitamin B complex and 100 mg of vitamin C in a private drugstore; 250 ml of the fluid was infused by an unlicensed person. It is prohibited to sell intravenous infusion fluid in a drugstore without a doctor's prescription in Korea, but it is not uncommon for someone to buy the fluid with no prescription, even when he or she feels only fatigue or mild discomfort. The male patient stopped the infusion and removed the intravenous line, and the remaining fluid was kept in his room at room temperature for 3 weeks. On 19 March 1999, his day of admission, he infused 250 ml of the remaining fluid and removed the intravenous line by himself. Five hours after that, he had a headache, blurred vision, and substernal pain radiating to his left shoulder and neck. He was immediately taken to the emergency room of Pusan National University Hospital. An examination of his initial vital signs showed low blood pressure (60/40 mm Hg), high fever (38.2°C), a respiratory rate of 24/min, and a pulse rate of 88/min, indicating septic shock. The leukocyte count was 11.7×10^9/liter with a shift to the left, and the D-dimer was 1.6 mg/liter. Three sets of blood for culture were drawn with a 30-min interval between each, and intravenous ceftriaxone and imipenem were started. Blood cultures were performed with the VITAL automatic system (Biomerieux Marcy l'Etoile, France). All four aerobic and anaerobic bottles of the first two sets showed positive signals, and gram-negative bacilli were discovered by Gram stain. The bacteria were all identified as *R. aquatilis*. The infusion fluid was cultured in a blood agar plate and a MacConkey agar plate, because it was suspected as a possible contaminant, and the same bacillus was grown. All bacteria isolated from blood and infusion fluid were identified as *R. aquatilis* initially by the API 20E commercial system version 4.0 (Biomerieux) with code no. 1205573 (80.5%). Because *R. aquatilis* is a very uncommon pathogen, we tried to identify the isolate by using two more commercial kits. The additional kits showed good identification: code no. 6764675051 (99%) of BBL Crystal ID System E/NF version 4.0 (Becton Dickinson Microbiology System, Sparks, Nev.) and bionumber 6664770430 (98%) of Vitek GNI version VTK-R06.01 (Biomerieux Vitek, Hazelwood, Mo.). The species identification was confirmed by temperature-dependent motility and growth characteristics and lack of yellow pigment production (Table 1). On the third day of admission, the antimicrobial susceptibility test by the National Committee for Clinical Laboratory Standards-recommended disk diffusion method (9) resulted in susceptibility to ciprofloxacin, cefotaxime, cefoxitin, gentamicin, imipenem, cefamandole, and trimethoprim-sulfamethoxazole and resistance to ampicillin and cephalothin. The treatment with intravenous ceftriaxone and imipenem was continued for the first 3 days, because the isolate was susceptible to ceftriaxone and imipenem and because cefotaxime and ceftriaxone are a relative group of agents that has an almost identical spectrum of activity and interpretative results and for which cross-resistance and susceptibility are nearly complete (9). Supportive electrolyte and fluid therapy was undergone for 3 additional days. On the sixth day of admission, the man's vital signs had normalized: blood pressure, 110/80 mm Hg; body temperature, 36.3°C; respiratory rate, 22/min; and pulse rate, 76/min. The leukocyte count and D-dimer had also normalized. He was discharged on the 13th day of admission with good health. At the time of discharge, the human immunodeficiency virus antibody was negative and the lymphocyte count was 2.66×10^9/liter, with a normal CD4/CD8 ratio. The blood culture was not done.

R. aquatilis used to be misidentified frequently as *Enterobacter agglomerans* by the commercial systems, because of the resemblance of their biochemical characteristics and the omission of *R. aquatilis* in the database (1). In this case, the bacteria were identified as *R. aquatilis* by the absence of yellow pigmentation, motility at 22°C but not at 36°C, and growth at 4 to 10°C (3, 4). At present, not only the API 20E system but also the Vitek and BBL Crystal ID systems contain the organism *R. aquatilis* in their data banks, and the identification of the organism is not difficult.

Caroff et al. (2) reported two cases of epidemiologically related bacteremia due to contaminated in-house total parenteral nutrition solution. The intravenous infusion fluid is sometimes purchasable from drugstores in Korea, and the infusion is administered frequently by unlicensed personnel. In this case, the patient administered the inappropriately stored fluid to himself. This circumstance is very unusual, even in Korea.

* Corresponding author. Mailing address: Department of Clinical Pathology, College of Medicine, Pusan National University, #10 1-Ga Ami-Dong Seo-Gu, Pusan 602-739, Korea. Phone: 82-51-240-7418. Fax: 82-51-247-6560. E-mail: cchl@hyowon.pusan.ac.kr.

TABLE 1. Biochemical reactions of *R. aquatilis* isolated from this study compared with those reported in the literature

Biochemical reaction	% of strains with a positive reaction[a]	Result for *R. aquatilis* isolate by:			
		M[b]	API[c]	BBL[d]	Vitek[e]
Motility at 36°C	6	−			
Motility at room temperature	100	+			
Arginine dehydrolase	0		−		−
Lysine decarboxylase	0		−		−
o-Nitrophenyl-β-D-galactopyranoside	100		+	+	−[f]
Citrate (Simmons)	94	+	+	+	+
Esculin hydrolysis	100			+	+
Gelatin hydrolysis (22°C)	0		−		
Hydrogen sulfide	0	−			
Indole production	0	−	−		
Malonate utilization	100			+	+
Nitrate→Nitrite	100	+			
Ornithine decarboxylase	0		−		−
Oxidase (Kovács)	0	−			
Phenylalanine deaminase	95	−		−	
Urea	0	−	−	−	−
Voges-Proskauer	100		+		
Yellow pigmentation	0	−			
Carbohydrate fermentation from:					
Adonitol	0			−	−
Arabinose	100		+	+	+
Glucose acid	100	+	+		+
Inositol	0		−	−	−
Lactose	100	+			+
Maltose	94				+
Mannitol	100		−	+	+
Mannose	100			+	
Melibiose	100		+	+	
Raffinose	94				+
Rhamnose	94		+	+	+
Sorbitol	94		+	+	+
Sucrose	100	+		+	+
Xylose	94				+

[a] Percentage of strains showing positive reactions as reported by Farmer et al. (3).
[b] Results by the manual (M) technique.
[c] Results by the API 20E commercial system version 4.0 (Biomerieux).
[d] Results by the BBL Crystal ID System E/NF version 4.0 (Becton Dickinson Microbiology System).
[e] Results by the Vitek GNI version VTK-R06.01 (Biomerieux Vitek).
[f] The Vitek result showed discrepancies with the API and BBL systems, but we considered the isolate positive, because it showed a pink colony at the MacConkey agar plate and fermented lactose.

The patient was in a state of septic shock at the time of admission.

All the previous reports of *R. aquatilis* infections are limited to immunocompromised patients or pediatric patients with congenital heart disease. We believe that this is the first case report of sepsis in an immunocompetent patient.

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